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मानक

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Jawaharlal Nehru

“Step Out From the Old to the New”

IS 8872-4-2 (1983): Variable Resistors, Part 4: Presets, Section 2: Type Vrt 2p [LITD 5: Semiconductor and Other Electronic Components and Devices]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

SPECIFICATION FOR VARIABLE RESISTORS

PART 4 PRESETS

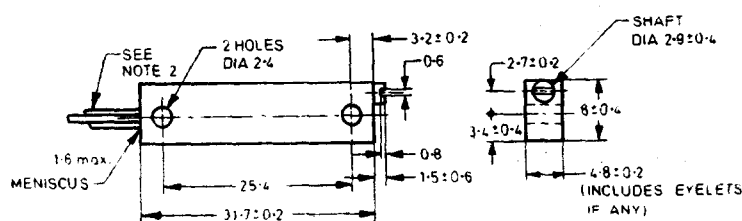
Section 2 Type VRT 2P

0. General — This standard shall be read in conjunction with IS : 8872 (Part 1)-1977 'Specification for variable resistors : Part 1 General requirements and methods of tests'.

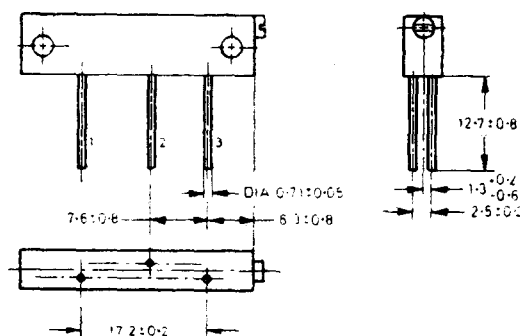
0.1 Scope — This standard applies to wirewound, multiturn presets.

1. Outline Drawing and Dimensions

1.1 Style VRT 2A-0.75 — Multiturn, Rectangular Casing — The outline, drawing and dimensions shall be as given in Fig. 1.



(a) Flexible, Insulated, Wire Leads



(b) Printed Circuit Pins (Staggered)

Note 1 — Unless otherwise specified tolerance is ± 0.13 mm.

Note 2 — The three leads shall be stranded wire of 0.255 mm to 0.321 mm diameter, 152.40 mm minimum length; they shall be insulated with PTFE, stripped approximately 6.35 ± 0.05 mm from the end.

FIG. 1 MULTITURN RECTANGULAR CASING (STYLE VRT 2A-0.75)

1.2 Style VRT 2B-0.25 — Multiturn Square Casing — The outline, drawing and dimensions shall be as given in Fig. 2.

1.3 Style VRT 2B-0.75 — Multiturn Square Casing — The outline drawing and dimensions shall be as given in Fig. 3.

2. Ratings — Ratings shall be as specified in Table 1. For ratings at temperature other than 85°C, reference shall be made to derating curve given in 4.

Adopted 29 September 1983

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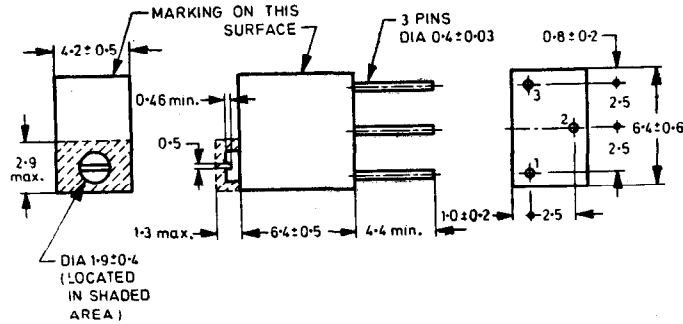
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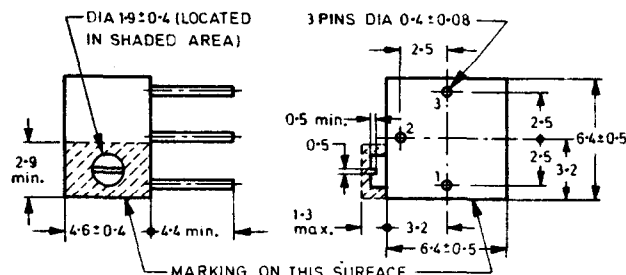
TABLE 1 RATINGS
(Clause 2)

SI No.	Style	Rated Power at 85°C	Resistance Range	Tolerance	End Resistance	Effective Electrical Travel	Isolation Voltage		Resolution	Max Torque
							Normal pressure V	Low air pressure V		
(1)	(2)	W (3)	(4)	(5) Percent	(6)	(7)	(8)	(9)	(10) Percent	(11) (gms/cm)
1.	VRT 2A-0.75	0.75	10 Ω 10 k Ω	10	2 percent of the element resistance or 1 Ω which- ever is greater	17 turns, <i>Min</i> 27 turns, <i>Max</i>	900	300	2.2 to 0.3	350
2.	VRT 2B-0.25	0.25	10 Ω 2 k Ω	10	do	10 turns, <i>Min</i> 25 turns, <i>Max</i>	650	200	1.85 to 0.44	350
3.	VRT 2B-0.75	0.75	10 Ω 10 k Ω	10	do	20 turns, <i>Min</i> 42 turns, <i>Max</i>	900	300	1.3 to 0.14	350

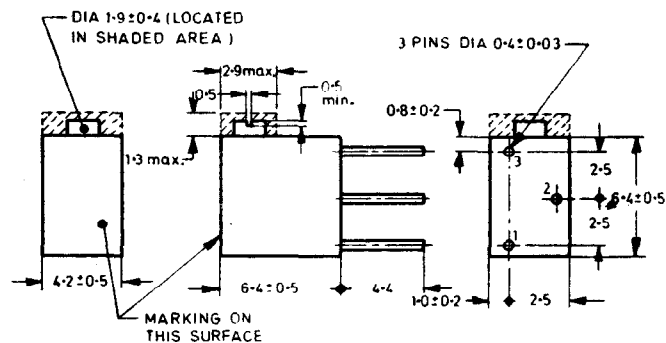
Note — For terminal configuration refer to Fig. 1, 2 and 3.



(a) Printed Circuit Pins (Edge Mount)



(b) Printed Circuit Pins (Base Mount)



(c) Printed Circuit Pins (Edge Mount) (Alternate Configuration)

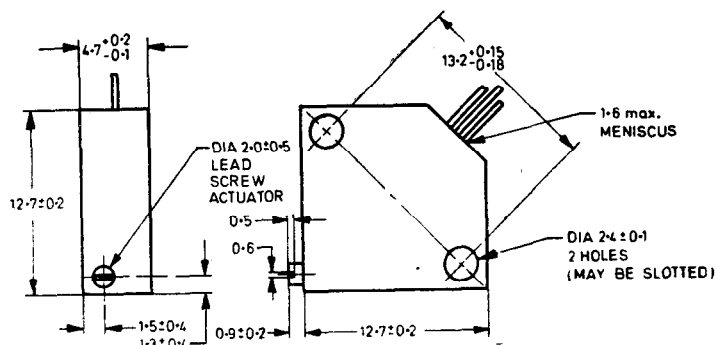
Note 1 — Unless otherwise specified, tolerance is 0.13 mm.

Note 2 — The entire slot of the actuating screw must be above the surface of the unit.

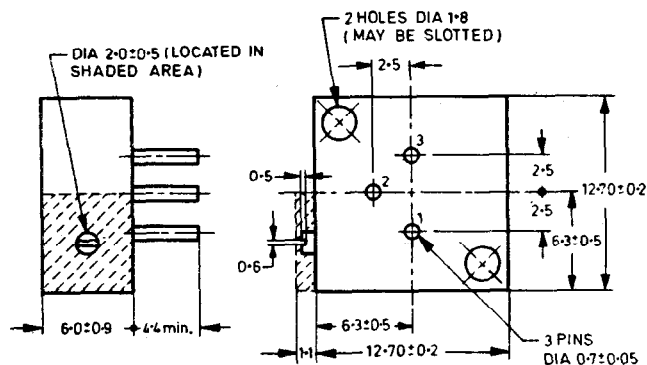
FIG. 2 MULTITURN SQUARE CASING (STYLE VRT 2B-0'25)

3. Characteristics

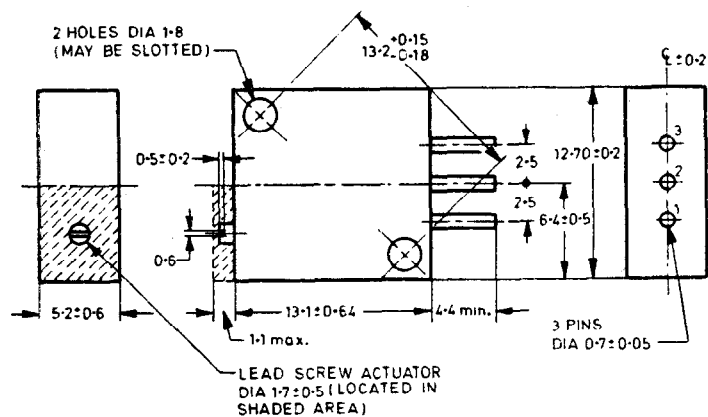
a) Selection tolerance	± 5 percent
b) Stability class	± 2 percent
c) Temperature coefficient	± 50 ppm/°C
d) Vibration	10 – 2 000 Hz, 200 m/s ² , 3 × 4 h
e) Shock	1 km/s ²
f) Acceleration	1 km/s ²
g) Bump	4 000, 400 m/s ²
h) Climatic category	55/150/56
j) Low air pressure	4.4 kPa
k) Maximum surface temperature	150°C
m) Typical construction	Wire-wound



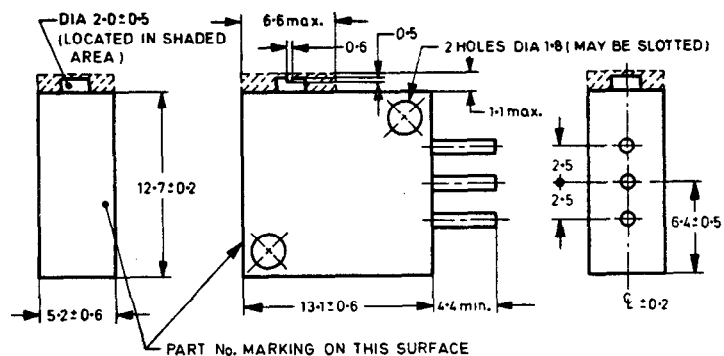
(a) Flexible, Insulated Wire Leads



(b) Printed Circuit Pins (Base Mount)



(c) Printed Circuit Pins (Edge Mount)



(d) Printed Circuit Pins (Edge Mount) (Alternate Configuration)

Note 1 — Unless otherwise specified, tolerance is ± 0.13 mm.

Note 2 — The entire slot of the actuating screw must be above the surface of the unit.

Note 3 — For printed circuit pin (base mount) terminal types, normal mounting means is by use of pins only.

Note 4 — The three leads shall be stranded wire of 0.255 mm to 0.321 mm diameter, 152.40 minimum length, they shall be insulated with PTFE, stripped approximately 6.35 ± 1.57 mm from the end.

Note 5 — Dimensions not shown for the Printed Circuit Pins type are same as these for Flexible Insulated Wire-leads type.

FIG. 3 MULTITURN SQUARE CASING (STYLE VRT 2B-0'75)

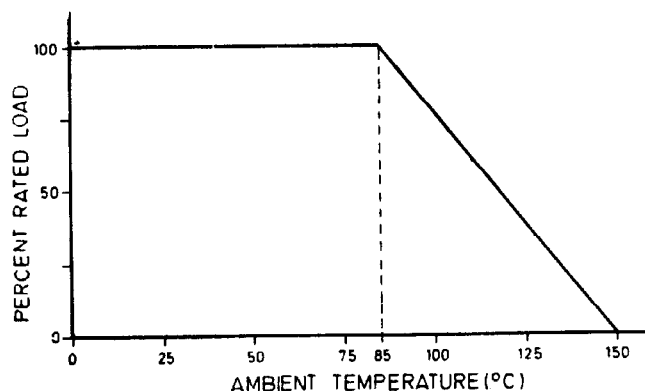


FIG. 4

4. Derating Curve**5. Marking** — See 6 of IS : 8872 (Part 1)-1977.**6. Material, Construction and Workmanship** — See 5 of IS : 8872 (Part 1)-1977.**7. Tests****7.1 Classification of Tests****7.1.1 Type tests** — The procedure for type approval shall be in accordance with IS : 2612-1965*. The sequence of type tests shall be in accordance with Table 3.**7.1.1.1** The manufacturer shall submit for each rated dissipation, the number of samples as given below :

Highest value	16
Middle value	16
Lowest value	16

The number of samples of one value for each test shall be in accordance with Table 3.

7.1.1.2 If resistors, variable of one termination type in a particular pattern are approved, the type approval may be extended to the variable resistors of other termination types in the same pattern provided that the internal construction is the same and additional testing is performed on the samples as given in 7.1.1.3.**7.1.1.3** Eight specimens each of the highest, middle and the lowest resistance value in each additional termination type shall be submitted for type approval and these shall be subjected to group 0, 1, 2 and 3 tests.**7.1.2 Routine tests** — The following tests shall be carried out on each and every resistor:

- a) Visual examination,
- b) Electrical continuity,
- c) Total resistance, and
- d) Sealing.

7.1.2.1 If during routine tests more than 10 percent of the lot fails, the entire lot may be rejected.**7.1.3 Acceptance tests** — The resistors which have passed the routine tests shall be subjected to these tests. The acceptance tests and the failure criteria shall be as given in Table 2.**7.2 General Conditions for Tests** — See 7 of IS : 8872 (Part 1)-1977.**7.2.1** The test schedule and the requirements shall be in accordance with Table 3.TABLE 2 SCHEDULE OF ACCEPTANCE TESTS
(Clause 7.1.3)

Sl No. (1)	Test (2)	Clause Ref in IS : 8872 (Part 1)-1977 (3)	AQC Defective) (Present (4)	Inspection* Level (5)	D/ND† (6)
i) Group A			1 percent	II	
a) Dimensions		9.1.1			
b) Setting stability		—			
c) Voltage proof (flash test)		8.10			
d) Operating torque		9.2			ND
e) Noise (Equivalent Noise Resistance)		8.12			
ii) Group B					
Sub-group B1			4 percent	S3	ND
a) Solderability		9.8.3			
Sub-group B2			4 percent	S3	D
a) Resistance to soldering heat		9.8.4			
b) Robustness of terminations		9.7			
c) Endurance (200 cycles) (Mechanical)		11.3			
Sub-group B3			4 percent	S3	D
a) Bump		9.10			
b) Climatic		10.1			
Sub-group B4			4 percent	S3	ND
a) Endurance (Electrical) (168 h)		11.4			

*See Indian standard sampling plans and procedures for inspection by attributes for electronic items (under preparation).

†D=Destructive, ND=Non-destructive.

*Recommendations for type approval and sampling procedures for electronic components.

TABLE 3 TEST SCHEDULE AND REQUIREMENTS
(Clauses 7.1.1 and 7.2.1)

SI No.	Test	Clause Ref in IS : 8872 (Part 1)-1977	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
i) <i>All Samples (Group 0)</i>				
a) Visual examination		9.1	—	The condition, workmanship and finish shall be satisfactory. Marking shall be legible and indelible.
b) Dimensions		9.1.1		Dimensions shall be as per Fig. 1, 2 and 3 for different styles.
c) Element resistance		8.2	—	Shall be within the selection tolerance of ± 5 percent.
d) Terminal resistance		8.3	—	The minimum terminal resistance at either end of the resistor shall not exceed 1 ohm or 0.25 percent of the total resistance value whichever is greater.
e) Minimum effective resistance and angle of ineffective rotation		8.5	—	The resistance value at angular positions are recorded for information only.
i) Angle of ineffective rotation (from termination 'a')		8.5.1	—	
ii) Values of minimum effective resistance (from termination 'a')		8.5.2	—	
iii) Angle of ineffective rotation and value of minimum effective resistance (from termination 'c')		8.5.2	—	
f) Effective resistance and angle of effective rotation		8.6	—	
g) Voltage proof (2 seconds duration)		8.9	600V RMS for styles VRT2B 0.25 and 900V RMS for other styles	As per Table 1.
h) Insulation resistance		8.10	—	There shall be no breakdown or flashover.
j) Operating torque		9.2	The operating torque required to operate the contact arm at approximately 10, 50 and 90 percent of the actual effective electrical travel shall be determined	The value shall be not less than 1 000 megohms.
k) Clutch operation		9.4.2	—	The torque shall be maximum of 21.2 mNm for style VRT 2B0.25, and 24.5 mNm for other styles.
m) Sealing		11.5.2	Not applicable to styles with flexible insulated terminals	The contact arm shall idle against the stop without electrical discontinuity or evidence of mechanical damage. The travel of the contact arm shall also be capable of reversing direction.
ii) <i>First Group (4 Samples)</i>				No bubbling shall occur.
a) Solderability		9.8.3	Not applicable to styles with flexible insulated terminals	There shall be no visible damage.
b) Robustness of terminations		9.7	Tensile : 10 N Bending : 1 Bend to be bent through 90°	There shall be no electrical discontinuity.
c) Bump*		9.10	4 000 Bumps, 400 m/s ²	—
i) Initial measurements				
1) Setting stability		8.2	The contact arm shall be set at approximately 40 percent of the actual effective electrical travel	The value of the setting stability ratio shall be recorded.
2) Element resistance		8.2	—	The value shall be recorded.

(Continued)

*Throughout the test, the resistance shall be connected to a suitable monitoring device to determine electrical discontinuity. It is desirable that the detecting equipment shall detect any interruption with a duration of 0.1 millisecond or greater.

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS : 8872 (Part 1)-1977	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	ii) Final measurements			
	1) Setting stability	—	—	The change in the setting stability ratio from the value recorded in Sl No. (ii) (c) (i) (1) above shall not exceed ± 1 percent plus the maximum resolution specified.
	2) Element resistance	8.2	—	The change in the resistance from the value recorded in Sl No. (ii) (c) (i) (2) shall not exceed ± 1 percent for resistance value of 100 Ω or greater and (± 1 percent + 0.05 Ω) for values below 100 Ω .
	3) Visual examination	9.1	—	There shall be no fracture loosening of parts or other mechanical damage.
	d) Vibration*	9.9	10 to 2 000 Hz 200 m/s ²	—
	i) Initial measurements			
	1) Setting stability	—	The contact arm shall be set at approximately 40 percent of the actual effective electrical travel	The value of the setting stability ratio shall be recorded.
	2) Element resistance	8.2	—	The value shall be recorded.
	ii) Final measurements			
	1) Setting stability	—	—	The change in the setting stability ratio from the value recorded in Sl No. (ii) (d) (i) above shall not exceed ± 1 percent plus the maximum resolution specified.
	2) Element resistance	8.2	—	The change in the resistance from the value recorded in Sl No. (ii) (d) (i) 2 shall not exceed ± 1 percent for resistance value of 100 Ω or greater and (± 1 percent + 0.05 Ω) for values below 100 Ω .
	3) Noise	8.12	—	The peak noise shall not exceed 200 ohms.
	e) Shock*	9.11	1 km/s ²	—
	i) Initial measurements			
	1) Setting stability	—	The contact arm shall be set at approximately 40 percent of the actual effective electrical travel	The value of the setting stability ratio shall be recorded.
	2) Element resistance	8.2	—	The value shall be recorded.
	ii) Final measurements			
	1) Setting stability	—	—	The change in the setting stability ratio from the value recorded in Sl No. (ii) (e) (i) (1) shall not exceed ± 1 percent plus the maximum resolution specified.
	2) Element resistance	8.2	—	The change in the resistance from the value recorded in Sl No. (ii) (e) (i) 2 shall not exceed ± 1 percent for resistance value of 100 Ω or greater and (± 1 percent + 0.05 Ω) for values below 100 Ω .
	3) Noise	8.12	—	The peak noise shall not exceed 200 Ω .
	4) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.

(Continued)

*Throughout the test, the resistors shall be connected to a suitable monitoring device to determine electrical discontinuity. It is desirable that the detecting equipment shall detect any interruption with a duration of 0.1 millisecond or greater.

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

SI No.	Test	Clause Ref in IS : 8872 (Part 1)-1977	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
f)	Acceleration*	9.12	1 km/s ²	—
i)	Initial Measurements			
	1) Setting stability	—	The contact arm shall be set at approximately 40 percent of the actual effective electrical travel	The value of the setting stability ratio shall be recorded.
	2) Element resistance	8.2	—	The value shall be recorded.
ii)	Final Measurements			
	1) Setting stability	—	—	The change in the setting stability ratio from the value recorded in SI No. (ii) (f) (i) 1 shall not exceed ± 1 percent plus the <i>max</i> resolution specified.
	2) Element resistance	8.2	—	The change in the resistance from the value recorded in SI No. (ii) (f) (i) 2 shall not exceed ± 1 percent for resistance value of 100 Ω or greater and (± 1 percent + 0.05 Ω) for values below 100 Ω .
	3) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.
g)	Rapid change of temperature	10.5	—	—
i)	Initial Measurements			
	1) Setting stability	—	The contact arm shall be set at approximately 40 percent of the actual effective electrical travel	The value of the setting stability ratio shall be recorded.
	2) Element resistance	8.2	—	The value shall be recorded.
ii)	Final Measurements			
	1) Setting stability	—	—	The change in the setting stability ratio from the value recorded in SI No. (ii) (g) (i) (1) shall not exceed ± 1 percent plus the <i>max</i> resolution specified.
	2) Element resistance	8.2	—	The change in the resistance from the value recorded in SI No. (ii) (g) (i) 2 shall not exceed ± 1 percent for resistance value of 100 Ω or greater and (± 1 percent + 0.05 Ω) for values below 100 Ω .
	3) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.
h)	Climatic sequence	10	—	—
i)	Initial Measurements			
	1) Element resistance	8.2	—	The value shall be recorded.
ii)	Intermediate Measurements			
	1) Dry heat	10.1.2	At +150°C	—
	2) Damp heat (cyclic) (first cycle)	10.1.3	One cycle	—
	3) Cold test	10.1.4	At -55°C	—
	i) Operating torque	9.2	—	The value shall not exceed 1.5 times the value specified in SI No. (i) (j).
	4) Low air pressure	10.1.5	4-4 kPa. During the last 5 minutes of the test resistors shall be loaded 50 percent of the rated dissipation subject to the low air pressure voltage limitation	

(Continued)

*Throughout the test, resistors shall be connected to a suitable monitoring device to determine electrical discontinuity. It is desirable that the detecting equipment shall detect any interruption with a duration of 0.1 millisecond or greater.

TABLE 3 TEST SCHEDULE AND REQUIREMENT — *Contd*

SI No.	Test	Clause Ref in IS : 8872 (Part 1)-1977	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	i) Voltage Proof	8.9	250V RMS for styles VRT 2B0'25 and 350V RMS for other styles	There shall be no breakdown or flashover.
	5) Damp heat (cyclic) (Remaining cycles)	10.1.6	No. of cycles 5	—
	iii) Final Measurements			
	1) Visual examination	9.1	—	There shall be no corrosion fracture, loosening of parts or other mechanical damage. The marking shall be legible and indelible.
	2) Element resistance	8.2	—	The change in resistance from the value recorded initially shall not exceed ± 2 percent for resistance values of 100 Ω or greater and (± 1 percent + 0.05 Ω) for values below 100 Ω .
	3) Insulation resistance	8.10	—	The value shall be not less than 100 Megohms.
	4) Voltage proof	8.9	—	There shall be no breakdown or flashover.
	iii) <i>Second Group (Two samples)</i>			
	a) Damp heat (long term)	10.2		
	1) Initial measurements			
	i) Element resistance	8.2	—	The element resistance shall be measured as specified in SI No. (i) (c).
	ii) Electrical loading	—	For half the specimens a direct voltage of 20 ± 2 V shall be applied. For other half no voltage shall be applied.	—
	2) Final measurements			
	i) Visual Examination	9.1	—	There shall be no corrosion, fracture, loosening of parts or other mechanical damage. The marking shall be legible and indelible.
	ii) Element resistance	8.2	—	The change in the resistance from the value recorded in SI No. (iii) (a) (i) (1) shall not exceed ± 1 percent for resistance value of 100 Ω or greater and (± 1 percent + 0.05 Ω) for values below 100 Ω .
	iii) Insulation resistance	8.10	—	The value shall be not less than 100 Megohms.
	iv) Voltage proof	8.9	—	There shall be no breakdown or flashover.
	v) Solderability	9.8.3	—	There shall be no visible damage.
	iv) <i>Third Group (Two Samples)</i>			
	a) Endurance (mechanical)	11.3	200 cycles	—
	1) Initial measurements			
	i) Element resistance	8.2	—	The value shall be recorded.
	ii) Final measurement			
	1) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical damage.
	2) Element Resistance	8.2	—	The change in resistance from the initial value shall not exceed ± 2 percent.
	v) <i>Fourth Group (Two Samples)</i>			
	a) Endurance (Electrical)	11.4	at + 85°C	—
	1) Initial Measurements			
	i) Element resistance	8.2	—	The value shall be recorded.
	ii) Setting stability	—	—	The value of the setting stability ratio shall be recorded.

(Continued)

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

SI No.	Test	Clause Ref. in IS : 8872 (Part 1)-1977	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	2) Final measurements			
	i) Visual examination	9.1	—	There shall be no fracture or any other mechanical damage. Marking shall be legible and indelible.
	ii) Element resistance	8.2	—	The change in resistance from the recorded value SI No. (v) (a) (i) shall not exceed ± 2 percent for resistance values of 100 Ω or greater and (± 1 percent + 0.05 Ω) for values below 100 Ω .
	iii) Insulation resistance	8.10	—	The value shall be not less than 1 000 M Ω .
	iv) Voltage proof	8.9	—	There shall be breakdown or flashover.
	v) Setting stability	—	—	The change from the initial value recorded shall not exceed ± 2 percent plus the maximum resolution specified in Table 1.
	b) Flammability	11.2	—	—
vi)	<i>Fifth Group (One Sample)</i>			
	a) Mould growth	10.4	—	There shall be no mould growth.
vii)	<i>Sixth Group (One Sample)</i>			
	a) Resistance to solvents	11.1	—	The marking shall remain legible. There shall be no mechanical deterioration.
	b) Resistance to soldering heat	9.8.4	Not applicable to styles with flexible insulated terminals	—
	1) Initial Requirements			
	i) Element resistance	8.2	—	The value shall be recorded.
	2) Final measurements			
	i) Visual examination	9.1	—	There shall be no fracture, loosening of parts or other mechanical deterioration.
	ii) Element resistance	8.2	—	The change in resistance from the initial value shall not exceed ± 1 percent for resistance values of 100 Ω or greater and (± 1 percent + 0.05 Ω) for values below 100 Ω .
viii)	<i>Seventh Group (Two Samples)</i>			
	a) Temperature characteristics of resistance	8.11	The resistor shall be maintained at 85°C for 4 hours and allowed to cool to reference temperature for not less than 4 hours. The temperature for measuring the resistance in Step (d) shall be 85°C.	The value shall not exceed ± 0.05 percent/°C.
	b) Salt mist	10.3	4 days	—
	1) Visual examination	9.1	—	There shall be no corrosion, loosening of parts or other mechanical deterioration. The marking shall be legible and indelible.
	2) Element resistance	8.2	—	This shall be within the initial specified limits of SI No. (i) (c).
	3) Insulation resistance	8.10	—	This shall not be less than 1 000 Ω .
	4) Operating torque	9.2	—	This shall be within the initial specified limits of SI No. (i) (g).

EXPLANATORY NOTE

While preparing this standard, assistance has been derived from JSS 50 50 4 'Detail specification for resistors, variable wire wound adjustment type, issued by The Ministry of Defence, India. The corresponding JSS Patterns are RVA 1 (VRT2B-0.25), RVA 2 (VRT2A-0.75) and RVA3 (VRT2B-0.75).